POPULAR MECHANICS

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"Tells you how to do things." Written so you can understand it

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Repairing Great Locomotives in Mid Air

Eighty-Ton Engine Lifted by Crane in Erecting Shop and Shifted Around at Will While Suspended

IN THIS ISSUE:

First Wireless Message Across the Atlantic.
Lights That Burn For a Year.
Urges Irrigation by the Government.
Potato Machinery Now a Necessity.
Photographing Snow Crystals.
"Chauffeur" Is Explained.
Apparatus for Moistening the Air in Big Buildings.
Grade Climbing in a Tower.
Fireproof Quality of Cement.
Steam Rollers at Grand Rapids.
Wagon Hubs Are Made of Birch.
Courtesies at Sea.
Railways in the Bowels of the Earth.
Fire on a High Tension Pole Line.
Locomotive Repair Work at the Collinwood Shops, L. S. & M. S. Ry.
American Invasion of Europe's Farms.
Preparing a New Flat Iron for Use.
Like the Old-Time Massassepo.
Why Headache Powders are Deadly.
Prettiest Tunnel in the World.
Effect of Poisons on the Body.
American Aborigines.
Shop Notes: Getting a Belt Out of the Way—Life of Automobile Tires—Use of Zinc—Pounding Air With a Hammer—Casting Steel Ingots in Horizontal Molds—Accidents are Increasing—Tool for Holding Plow Bolts—A Tunnel Full of Power

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REPAIRING GREAT LOCOMOTIVES IN MID-AIR.

Eighty-Ton Iron Horses Lifted and Moved About as Lightly as Toys.

Raising an 80-ton locomotive from the floor to the top of the ceiling, and hauling it, thus suspended, the entire length of a great building, is an impressive and rather startling sight that may be witnessed almost any day at the Collinwood shops of the Lake Shore & Michigan Southern Railroad. Even old time locomotive builders have to pause in awe as they see these giant iron horses that haul great trains of freight across the country, moved about almost as lightly as if they were toys. Repairs are made in mid-air by the workmen who ride with the locomotive while it is being lifted and moved along the length of the building. The engines are lifted by a crane in what is known as the erecting shop, as is shown in the front page illustration, the first picture of this remarkable performance that has ever been obtained.

The American Engineer in describing the process states: Tenders are disconnected from their locomotives outside of the shop, and by means of the pony engine the locomotive is put on turntable and then into the shop. No stripping is done on center or entering track; the engine, immediately after entering, is lifted by the large crane and set on a shop pit designated in advance for this particular engine.

The "stripping" gang then takes it in hand and before the cranes are lowered the pedestal caps, spring rigging, braces, etc. (that are necessary for the removal of drivers and trucks), are taken down; then the engine is raised and the driving wheels rolled out (without removal of rods, except back-end and main ones) toward the back of the engine and engine truck rolled out forward.

"Baskets" of steel, holding all the parts of one small locomotive, or one-half those of a large one, are placed nearby, so that the work destined to go to the cleaning vats may be immediately placed in them and the whole thing handled with the crane to a truck. These Collinwood shops are remarkable in their width, which is 168 feet.

OIL BRICK THAT WAS A FAILURE.

The papers have been telling how a man could take an ordinary brick, soak it in oil, and use it in his stove as an excellent substitute for coal. A certain man concluded to try the experiment and surprise his wife. He did both. Going to a friend who had bricks galore he explained his purpose, and the friend was delighted to oblige him. In fact, the friend made him take six of them. By the time he reached home they weighed over a ton. Not waiting to eat his supper, he proceeded to immerse the bricks in oil, while his wife told him the scheme wouldn't work. During the soaking process he covered himself and the carpet with a liberal supply of oil. Meanwhile supper grew cold. In half an hour he made the first attempt, using up all the matches in the house. But the bricks refused to light, much less burn. Then he bored holes in them, spoiling all his bits in the process, and spent nearly an hour in this occupation. Alternate soakings, borings, and transfers to the stove lasted until midnight. Then he quit.

Next morning in telling the man next door of his woe, the neighbor declared it would work, of course it would. The result of the interview nearly terminated a friendship of 10 years. Finally the neighbor came over to look at the bricks.

"Well, you are a chump," was all he said.

The bricks were vitrified and could soak up about as much oil as a glass marble.

Indians in Mendocino county, Cal., use clover regularly as an article of food, eating its leaves, stems and flower heads without cooking.

MARCONI ANNOUNCES A TRIUMPH COMPLETE.

First Wireless Message Flashed Across the Ocean, and the New System is a Success in Fact.

By Guglielmo Marconi.

"I beg to inform you that I have established wireless telegraphic communication between Cape Breton, Canada, and Cornwall, England, with complete success. Inauguratory messages, including one from the governor general of Canada to King Edward VII, have already been transmitted and forwarded to the kings of England and Italy. A message to the London Times has also been transmitted in the presence of its special correspondent, D. Parkin, M. P."

Marconi's Christmas gift to the world is "wireless telegraphy a reality." December 21 will go down in history as the memorable day on which the first message was flashed across the ocean without the aid of wires. It was a greeting from the new world to the old. It binds the two continents, and all the continents, closer together than ever before. It eradicates distance in conversation. Trans-oceanic cables and electric telegraph wires may be relegated to antiquity. Air, the earth's common endowment, will be used as a medium for the transmission of words between two continents. It means a new age —a new era of civilization.

Following is the first wireless transatlantic message sent from America to England:

"Being present at its transmission in Sig. Marconi's Canadian station, I have the honor to send the Times the inventor's first wireless transatlantic message of greeting to England and Italy. "P. Parkin."

The message was flashed 2,300 miles, which is the distance between Glace Bay, N. S., and Cornwall, Eng. Marconi has been conducting experiments at Table Head, Cape Breton, for more than a year. Prior to December, 1901, the greatest distance covered by wireless telegraphy scarcely exceeded 100 miles. The newly equipped station at Table Head, Glace Bay, near Sydney, is 2,300 miles from Poldhu and to Cape Cod is 500 miles further. All three stations are similarly constructed. At each four square wooden towers are erected. Each tower is 28 feet across at the base, from 9 to 12 feet across at the top and 215 feet high. From each of the four horizontal bridges that connect the tops of the towers are suspended 50 copper cables. The cables are composed of seven strands, an eighth of an inch in diameter, tightly twisted together. It will thus be seen that the solitary vertical wire of the original Marconi experiment has not been enormously multiplied. The 50 cables of each of the four groups converge a little as they go downward, and also incline slightly toward the center of the quadrupled edifice. The lower ends are arranged along the sides of a square much smaller than that formed by their supports at the top. They terminate in the operating room of the station.

It is expected Mr. Marconi will retain the now famous coherer as his receiving instrument for the present, although he has invented a substitute for it, a magnetic detecter, which in some respects is more satisfactory. When he wishes to insure noninterference he will employ the tuning system invented by Prof. M. I. Pupin of New York, whose rights he purchased last spring.

In the transmitting apparatus transformers will be substituted for the old fashioned induction coil.

An alternating current, generated by a forty horse power dynamo, will do the work. The voltage will be raised by the transformers from 2,000, at which the current is to be generated, to 20,000. Condensers and other electrical appliances will increase this still further. Thus a voltage of from 50,000 to 70,000 will be secured.

Lights That Burn for a Year

Pintsch Gas Buoys Serve as a Beacon and Ring a Bell at the Same Time

Lights that burn continuously, day and night, for an entire year, without requiring any attention, after once being lighted, have been installed in the new and novel gas-lighted bouys recently placed in service off Chicago and other points on the great lakes. The light, which is so powerful that it may be seen for six miles distant, is so arranged by an ingenious mechanism that its burning also rings a bell as an additional aid to navigation. The buoys are lighted by the Pintsch system, on the same principal as is employed in the lighting of trains.

Such a wonderful aid have they proven to mariners, that already 1,250 of the buoys have been stationed in different waters throughout the world. They furnish the first method of using compressed oil gas for coast or channel lighting. In Europe the use of the system has been extended to lightships, beacons and minor lighthouses, in which, of course, the lights are visible to a much greater distance at sea.

The device with the bell attachment is known as the Pintsch gas-lighted bell-buoy. A fixed or flashing light is shown and the gas passing from the body of the buoy which forms the receiver, for the gas, up into the burner, is led through a mechanical device which sets the bell to ringing. The sound occurs at regular intervals which may be predetermined. In the case of the old-fashioned bell-buoy, the sounding of the bell signal was dependent upon the movement of the water. When a fog prevails at sea it is usually calm, and hence the buoy was generally silent at the very time it was mostly needed. Before the introduction of this new system most buoys and beacons were lighted by means of oil.

There are two methods of filling the gas buoys. One consists in taking them up at regular intervals and transporting them by means of lighthouse tenders to the nearest Pintsch gas manufacturing plant. The other calls for the equipping of the lighthouse tenders with Pintsch compressors and storeholders. A supply of gas is taken aboard at the nearest city where Pintsch gas works are located. The vessel then goes out to the various buoys and pumps into each a year's supply of gas. The latter plan is the one now followed by the United States government and is in use on the great lakes where 70 of the buoys are stationed.

Pintsch Gas Lighted Buoys at Night.

LIKE THE OLD-TIME "MASSASSEPO."

Father-of-Waters to Resemble His Youthful Days During the World's Fair.

"Mark Twain" at the wheel in the pilot house of a Mississippi river steamboat during his visit to St. Louis has brought renewed attention to the river in quarters where the steamboat and the steamboatmen have not been thought of for years.

Steamboatmen all along the Mississippi and its navigable tributaries are already preparing for the world's fair in 1904 and are making arrangements to handle an immense passenger traffic. All this has the effect of putting new life into the steamboat business, which may be the beginning of another era of lively times on the old Mississippi. A Mississippi steam can accommodate from two to five hundred passengers, and during the world's fair they will be in shape to handle an immense traffic if only one-half the new boats contemplated are placed in service.

Children under ten years old cannot, as a rule, sit still more than 1½ minutes.

URGES IRRIGATION BY THE GOVERNMENT.

"Land Without Population is a Wilderness, and Population Without Land Is a Mob."

By James J. Hill, President of the Great Northern Railroad.

A wise system of irrigation by the general government can be made not only self-sustaining but a source of income. Lands that without irrigation are given away or sold at a nominal price can be sold as fast as they are furnished with water at $10 an acre and upward, and the cost would be little if anything more than half that sum. I cannot urge too strongly on the part of every man who wishes his country well and who desires that all shall be prosperous in order that he himself may be prosperous with them, the importance and the growing necessity of taking care of the public domain in such way as to preserve it for generations now unborn. The United States has many social questions to settle in the near future, and nothing in this connection will take the place of its ability to provide good homes for those who desire to sit under their own vine and fig tree. Land without population is a wilderness and population without land is a mob.

PHOTOGRAPHING SNOW CRYSTALS.

Method is Simple and Results are Pleasing, but Pains and Patience are Required.

The approach of winter again reminds us of the beautiful photographs that can be made with camera and microscope of snow crystals, if one has the requisite patience and enthusiasm, says the Photo Era.

In the Mineralogical Museum at Harvard University is a collection of photographs of snowy crystals that is practically a scientific record of New England snow-storms for the past twenty-five years. It is the work of one man—W. A. Bentley, of Nashville, Vt., and is a monument to his patience, skill, and enthusiasm. The crystals are infinite in variety, no two being alike, and range all the way from frost on the windowpane to the effect of snow in a forest of evergreens. The method of photographing them is so simple that anybody who has the right combination of camera and microscope can do it successfully.

Mr. Bentley recommends that the microscope should be fitted with a half-inch or two-thirds-inch objective, of wide aperture and short axis; that the focusing apparatus be exceptionally quick and accurate; the diaphragm aperture not more than one-sixteenth of an inch; the illumination, ordinary, uncondensed daylight; and the exposure (rapid plates being used) from forty seconds to five minutes. The chief difficulty to be overcome is to prevent the crystals from melting, and the whole work must be done in a cold room, with but one window in which to catch the flakes. A black card serves to collect the crystals as they fall, a bit of broom splint to place them on the glass side of the microscope, where they are pressed flat with a bit of feather; and the photographer must take especial care not to warm the slide by breathing upon it or by handling it with ungloved hands. The operation, in short, requires care, nicety, and patience, as well as apparatus.

One of the rules of the New York Stock Exchange, which is rigidly enforced, is that no bets or offers to bet shall be made on the floor.

Babies in Japan are counted two years old the first New Year's day after their birth.

POTATO MACHINERY NOW A NECESSITY.

Labor-Saving Implements Perform the Work Formerly Done by Hand.

The potato, which Webster's Unabridged Dictionary declares to be one of the greatest blessings bestowed on man by the Creator, is now a peer of corn, wheat and cotton in the attention given to its cultivation by manufacturers. It used to be that the growing of potatoes was done almost entirely by hand. They were cut up, planted, sprinkled, dug and assorted by hand. Now every branch of this work is done by machinery. Several extensive factories are engaged in the exclusive work of manufacturing potato implements. Some of the many machines used in the metamorphosis of the potato from the cut-up seed product to the toothsome "tubers," served on our tables have been illustrated and described in previous issues of Popular Mechanics. Herewith are shown the work of digging and assorting potatoes. The digger is a companion machine to the Aspinwall planter. The plow is concave with a draw-cutting edge, which is calculated to lessen the draft. A peculiarly constructed pulverizing wheel automatically removes the tops and weeds, throwing them to one side previous to separating the potatoes from the earth. The digger is adjustable to all widths of planting. It leaves the potatoes bare on the ground very convenient for gathering.

Potato Digger at Work.

The sorter separates the potatoes into three sizes, the marketable or large potatoes, second sorting or seed, and the third sorting which falls through with the sand and dirt into a wire screen from which the dirt is afterward sifted. The potatoes are poured into the hopper onto a moving elevator with long distance travel. The hopper is down low so that it is easy to feed the machine. The entire work is under control of the operator.

A soft coal basin in which the vein is from fifteen to seventeen feet thick has been discovered at a depth of 1,000 to 1,500 feet in northern Belgium and southern Holland.

Babenet calculates that the substance from which comets are made is 140,000,000 times lighter than our air.

APPARATUS FOR MOISTENING AIR IN BIG BUILDINGS.

An arrangement for moistening the air secures ideal temperature conditions in the building of the American Bell Telephone company at Boston. It is an innovation for humanity's sake which it is believed will result in similar systems in all large buildings where many people are employed. Late investigations show that colds and many serious diseases are caused by the intolerable condition of the atmosphere in these buildings.

In the telephone building an average of nine pints of water a minute is injected or dispersed into the air, says Domestic Engineering, maintaing a fairly constant humidity of 50 to 55 per cent, and the supply can easily be regulated to any desired percentage. The apparatus accomplishes an unique scientific task, that of making a constant correction in the percentage of moisture in a very large inflow of air. The building is tenanted by 467 persons, to whom 26,000 cubic feet of air are furnished by artificial means. The air is drawn down a tube and then heated among the pipes of a big steam-heated stack. The steam used for humidifying the air is taken from the steam pipe of the engine at 90 pounds pressure and led through a series of pipes successively enlarging in diameter, like a telescope, the last pipe being perforated. Generally 2½ grains of water are added to each cubic foot of air a minute in cold dry weather, depending somewhat on the outside natural humidity. The amount of water entering the air in the form of steam, heats the air about 1½ degrees. If this amount of water at, say, 40 degrees, were sprayed into the air entirely, it would reduce the temperature 23 1-3 degrees and require more steam pipes for heating purposes. The whole amount of moisture is taken by the air in about one-sixth of a second.

The supply of steam for humidifying is controlled by a steam cock.

With this system of air moistening a temperature of 65 degrees in the building is more comfortable than a temperature of 75 degrees or more in dry air.

Air at a temperature of 32 degrees and with a humidity of 50 per cent contains 1.169 grains of water per cubic foot, the absolute humidity. If the same air is heated to 70 degrees without adding moisture the amount of water per cubic foot is reduced owing to the expansion of the air, to 1.086 grains and the relative humidity of the air, containing 100 per cent as saturation would be 12½ per cent, or only ¼ that of the natural atmosphere. This low percentage induces an extremely rapid evaporation from the surface of the body, so that the sensible temperature, or "feeling" of the air at 70 degrees would be as if it were 23 degrees less, or 47 degrees, rather cold indoor weather for the average citizen of the United States.

Potato Sorter at Work.

RULES FOR BARBERS.

The following rules have recently been adopted by the Chicago Barbers' Union: The use of sponges to be prohibited. The use of powder puffs to be prohibited. A separate, clean towel shall be used for each person. No person shall be allowed to use a barber-shop for a dormitory. Every barber-shop shall be provided with running hot and cold water. Every barber shall cleanse his hands thoroughly immediately after serving each customer. The place of business, together with all the furniture, shall be kept at all times in a cleanly condition. Alum, or other material, used to stop the flow of blood, shall be used only in powdered form, and applied on a towel. Mugs, shaving brushes and razors shall be sterilized by immersion in boiling water after every separate use thereof.

Popular Mechanics is used as a text book in many of the leading manual training schools.

Popular Mechanics

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This Issue 20,000 Copies

Following is the record of new yearly paid subscribers received by POPULAR MECHANICS during the past month:

WEEK ENDING	NOVEMBER	22	929
" "	"	29	859
" "	DECEMBER	6	1,054
" "	"	13	477
" "	"	20	650

Advertisers are invited to examine our books at any time. We tell the exact truth about our circulation and have nothing to cover up.

NOTICE TO SUBSCRIBERS.

Because our subscription list has so rapidly grown to cumbersome proportions, it has been necessary to change our former system of mailing, which was the same as is usually employed by weekly publications, to the advanced method now in use by the most widely circulated daily newspapers. Making the transfer from the stencil to the printed list was no small undertaking, as all the names had to be gone over and rearranged according to states and railroad routes. In this work there was some delay in recording the new names and it is quite probable that some of the new subscribers during the past two weeks have missed their paper. We shall be glad to send missing copies to any subscriber who will kindly advise us.

"CHAUFFEUR" IS EXPLAINED.

As chauffeur means one who heats something—a stoker or fireman—it is difficult to see why it should have been applied to a driver of a gasoline machine, says the Automobile Review. Probably it was applied first to Leon Serpollet, who obtained the first permit issued in Paris to the driver of an automobile. This machine was a steam tricycle, the boiler of which was heated with a coal fire. On his first trip the grate was shaken loose and the burning coal was dropped in a trail along the street before the mishap was discovered. De Dion's early experiments were also with steam. Possibly the Parisian newspapers fixed the term chauffeur at that time. It is no longer used, however, in France, to designate the owner of an automobile, even if he acts as his own driver, but is reserved for the hired assistant who may or may not be a mecanicien also. If he is a competent repairman as well as a driver, he is known as chauffeur-mecanicien or mecanicien only. In New York chauffeur means either the owner or his man; nobody can tell which except by the general sense. The tendency is toward the French distinction, and before another year rolls by, it will probably be bad form to refer to an amateur automobilist as a chauffeur.

While chauffeur remains in use, it might as well be spelltd and pronounced properly. A great many newspapers in the west persist in spelling it "chaffeur" and probably the majority of people, even those connected with the automobile industry, pronounce it shoffoor. The vowel sound in the first syllable should be about the same as in sauce or a little shorter than in cause. The last syllable cannot be rendered in English except as a broadening of the sound of fur, all the broadening falling on the vowel.

GRADE CLIMBING IN A TOWER.

A most extraordinary hill climbing feat is that depicted in the accompanying illustration. It occured recently in Copenhagen when Herr Lorenzen successfully drove his Beaufort car up the 25 per cent spiral grade within the Christian IV. tower. This tower, which was originally erected as an astronomical observatory, is over 100 feet high. The ascent was successfully made and the carriage was then driven rapidly down the curving grade without accident, says the Motor Age.

Up a 25 per cent Tower Grade.

FIREPROOF QUALITY OF CEMENT.

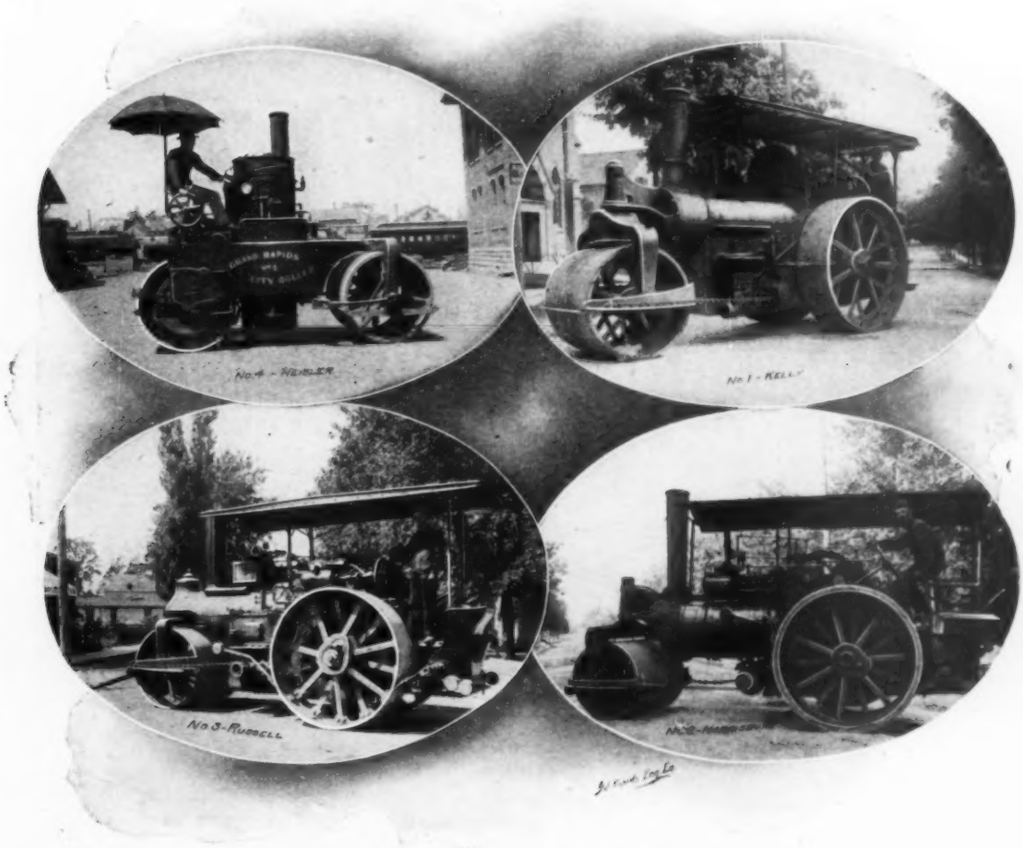
By G. J. Grieserman, Cement Tester, C., M. & St. P. Ry.

I noticed in your journal of Nov. 22, 1902, on page 724, under heading "Cement Spans in Buildings," article by Mr. E. C. Shankland, Cousta, Eng. Speaking of concrete as a fireproof material he says: "Furthermore, concrete is not nearly as fireproof as tile, which, like brick, goes through the fire in its manufacture." This statement needs modification. We have practical tests which show concrete to be as nearly fireproof as any material we know of. I would refer Mr. Shankland to "Cement," January, 1902, pages 358-359, under heading "A remarkable demonstration of the strength and fireproof qualities of concrete and cold-twisted steel construction," for very practical tests demonstrating this point. Also to Engineering News, Oct. 23, 1902, page 337, under heading "Concerning Concrete-filled Columns." There is more authority on this subject than the above mentioned, which clearly prove first class Portland cement concrete to be among our best fireproof materials, and I do not doubt that it will prove itself the leader in this class of materials and that within the near future.

The Metropolitan Street Railway Co., of New York, during the year 1902 gave out 200,000,000 transfers.

STEAM ROLLERS AT GRAND RAPIDS.

Grand Rapids, Mich., has many miles of finely paved streets, of which City Engineer Anderson has just reason to be proud. Municipal Engineering says: The city has thoroughly tested the value of steam rollers for extensive repairs of gravel and macadam streets and for rolling of subgrade and at other stages of new construction and now has four rollers, which are shown in the last plate of the series. For part of 1900 five rollers were in use at a total cost for maintenance and operation of $6,411.14. The amount of work was so great that rollers were run much of the time night and day. Under these conditions a roller for full time seems to cost a little over $1,800, of which nearly half is for engineer, less than one-fourth for repairs and other supplies. In 1901 the day's work was about 11 hours, and the total cost for the four rollers in use was $6,865.75. Operation for full time cost about $1,300 each and maintenance varied from about $200 to $1,300 on the rollers putting in full time, the latter figure including new firebox and rear rolls. There seems to be no question that the roller system is the best for Grand Rapids' conditions, and two new rollers have been acquired within the last three years, one replacing an old one after years of service.



City Road Rollers of Grand Rapids, Mich.

An artificial indigo made in Germany is driving the natural dye out of the market. One German plant for its manufacture cost $4,250,000.

In New York there are only 737,477 white persons born of native parents, or but 21.4 per cent of the population of the city.

WAGON HUBS ARE MADE OF BIRCH.

A universal wood for the manufacture of the hubs of farm and truck wagons is birch, says the American Lumberman. The manufacture of hubs is not an essential part of the wagonmaker's business. He buys his hubs already turned by the hubmaker, often making contracts for the season's supply. It is understood by all good wagonmakers that the only material suitable for high-class wagon hubs is red or black birch. And thereby hangs a tale. The hub manufacturer buys birch logs from 8 to 14 inches in diameter, bolts the logs and turns them up in hubs. These hubs are then steamed in hot water tanks and soaked in oil. This is done to prevent the hubs from checking, but incidentally it loosens up the albumen and all the coloring matter in the wood and distributes the color so that the oldest inhabitant could not tell the sap from the heart wood. Therefore it happens that when the hubmaker runs across a fairly decent specimen of yellow birch he does not throw it aside as worthless, but it also goes through the factory with the red and black birch material. A hubmaker was recently called on the carpet by a leading lumber wagon manufacturer who had a suspicion that he was receiving from him some yellow birch hubs. The hubmaker was immediately very indignant—apparently—and boldly said to the wagonmaker that he would give $5 apiece for every yellow birch hub he could find in one of his shipments. Needless to explain, the wagonmaker was not able to make good, as after birch hubs of any particular sort are thoroughly steamed in a tank of hot water and soaked in oil one kind of wood cannot be told from another.

FIRE ON A HIGH TENSION POLE LINE.

Blazed Forth Like a Grand Pyrotechnical Display.

Soon after the starting of the Aurora, Elgin & Chicago Railway, which is the new high-speed electric line connecting the three cities, a defective insulator on one of the 26,000-volt three-phase lines caused an electrically started fire on one of the poles, which was both beautiful and startling in its appearance. The pole that took fire, says the American Electrician, instead of burning in the ordinary way with a yellow flame, was so charged with the high-tension current that the flame shot straight out from the pole in all directions, and was of a bluish tinge. The burning took place very rapidly, and was accompanied with a roaring sound. The influence of the static charge which the pole had received evidently drove the flames out at right angles to the pole, and this together with the leakage from the lines through the pole was also probably the cause of the bluish color of the flame and the roaring. The pole was burned to the ground within a very short time. But little disturbance was noted on the ammeters on that feeder at the power house, so the volume of current escaping to the ground over the pole must have been very small. It has been noticed in a number of instances where leakages have produced fires over conductors of high resistance, such as dry wood or stone, that but a small amount of energy has been taken even though the disturbance at the seat of trouble was very great. In one case on record, leakage through a guy-wire on a 33,000-volt line in California to a large boulder into which the guy-wire was anchored caused the splitting in pieces of the boulder, and drops of slag oozed from it, but no unusual fluctuation of load at the power house was noticed.

The Sault Ste. Marie steel rail mills have closed temporarily because, it is alleged, it was impossible to compete with German rail makers.

RAILWAYS IN THE BOWELS OF THE EARTH.

Unique System Far Underground in Illinois Coal Mines.

Deep down in the ground in many of the modern coal mines in Illinois can be found well equipped wire rope railway systems that are unique in their method of operation. The accompanying illustrations show such roads in the Coal Valley Mining Company's mines at Cable, Ill. This is a late method of hauling the product of the coal mines to the hoists where it is raised to the top of the ground. It is called the tail rope system. The cars are run in trains. They weigh 850 pounds and hold one ton each. The regular haul of the Coal Valley Company is twenty cars. Fig. 1 shows the chain connection with the head of the train in the main tunnel, the method of supporting the tail rope and the chain operating wooden guide rollers. Fig. 2 shows a special arrangement for curves, in which some horizontal guide sheaves and the position of the rope with a train approaching are indicated.

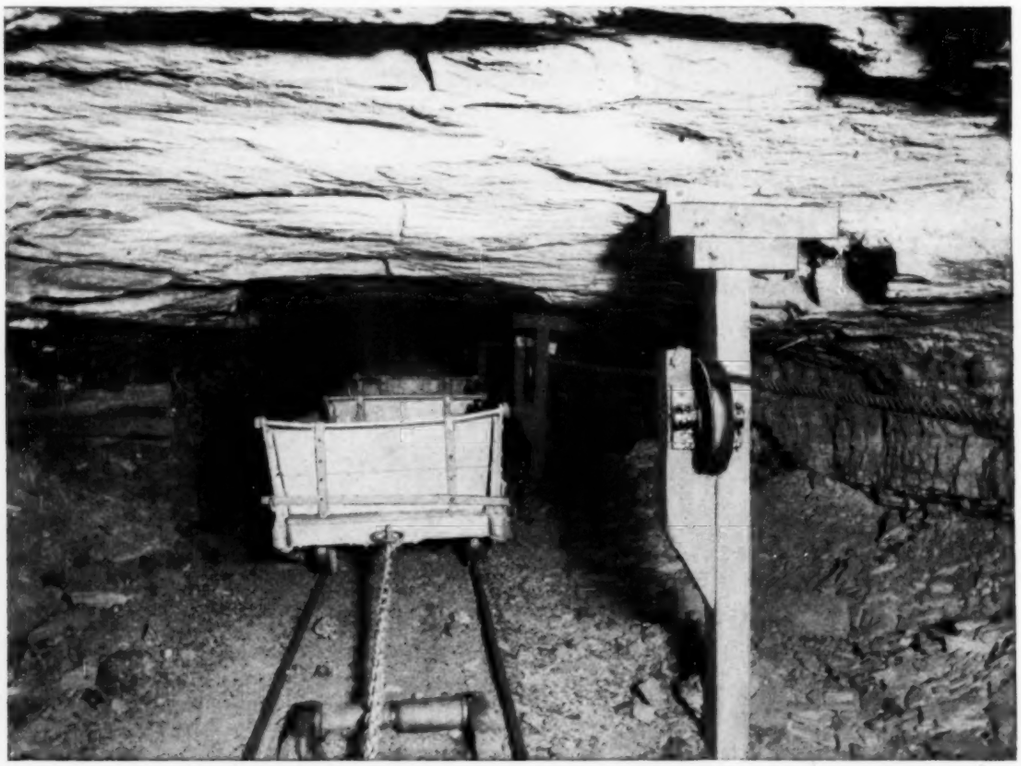


Fig. 1—Head of Train in Main Tunnel. Coal Valley Mining Co.

The Railway Review says: "The tail rope system consists of two ropes winding on separate drums, which may be located at different points, but which generally work on the same shaft. The main rope runs along the ground and is attached to the front of the loaded train. The 'tail' rope is supported along the walls of the roof of the tunnel, extending to the end of the haul, where it passes over a return wheel and is returned along the ground, being attached to the rear of the train. The main rope is then wound on its drum, hauling the load followed by the tail rope. For the return trip the motion is reversed. The tail rope is wound on its drum and the empty cars are drawn to the end of the haul, dragging the main rope."

An American company has secured for fifty years the exclusive right to establish telephone service in Cuba.

COURTESIES AT SEA.

Elaborate Details of Etiquette on Salt Water.

In the days before cannon, and, indeed, until comparatively recent times, a vessel made its salutation by lowering its flag. This is the oldest and most honorable greeting which a ship can give, and it ranks before the booming of guns, however many, says the London Standard.

This salute has always been demanded by English seamen, and its exaction has burned the hearts and the powder of generations of naval commanders. For a foreign ship, whether merchant or martial, to enter an English port without veiling topsails or lowering its national flag was to court the chances of war, though the profoundest peace existed. Without warning or argument the shore defenses or a man-of-war sent a round of shot across the bows or between the masts of the insolent intruder, and if the offending flag came not down instanter the foreigner was brought to her senses by being raked through and through. Such was the reception accorded by John Hawkins to the Spanish admiral, who in time of peace sailed into Portsmouth Sound without veiling his topsails or striking his flag. The Dutch vehemently resisted the British demand, and it was not until 1673 that they finally agreed to strike the English colors in home waters. The same honor was formally assented to by France in 1704, although it had long been exacted by Britain.

Until modern times it was regarded as a high misdemeanor for a merchant vessel to pass one of His Majesty's ships without dipping her ensign, and the consequence was that a shot across her bows compelled her to heave to while her captain's name was taken, the Admiralty instituting a prosecution against him for his negligence. The trading ship dips her ensign and waits for the man-of-war's dip in return. Then she dips again, and after that, in strict etiquette, she ought to dip a third time, but this is seldom done now. The maritime supremacy of Britain is still enforced by refusal of any British war vessel to dip its flag to any foreign ship until the latter has first lowered its colors, and this acknowledgment of precedence is required not only in home waters, but in all seas.

But naval salutes are now essential matters of etiquette, and are exchanged under an elaborate code, arranged between foreign powers and the Admiralty in 1876. The number of guns to be fired under all conceivable circumstances is minutely stipulated. Second to the salute of 21 guns in honor of royal personages and national flags are the 19 rounds given to ambassadors; colonial governors, foreign possessions and fortresses receive 17 guns, and envoys extraordinary and ministers plenipotentiary 15. Two guns less are fired for lieutenant governors. Charges de affaires are treated to 11, consuls general to 9 and a mere consul to 7. The salute for admirals of the fleet is 17 guns, and for admirals simpliciter 15. Vice admirals are greeted with 13 and rear admirals with two less, while 9 guns are fired for commodores; captains and lower officers being classed as not worth the burning of powder.

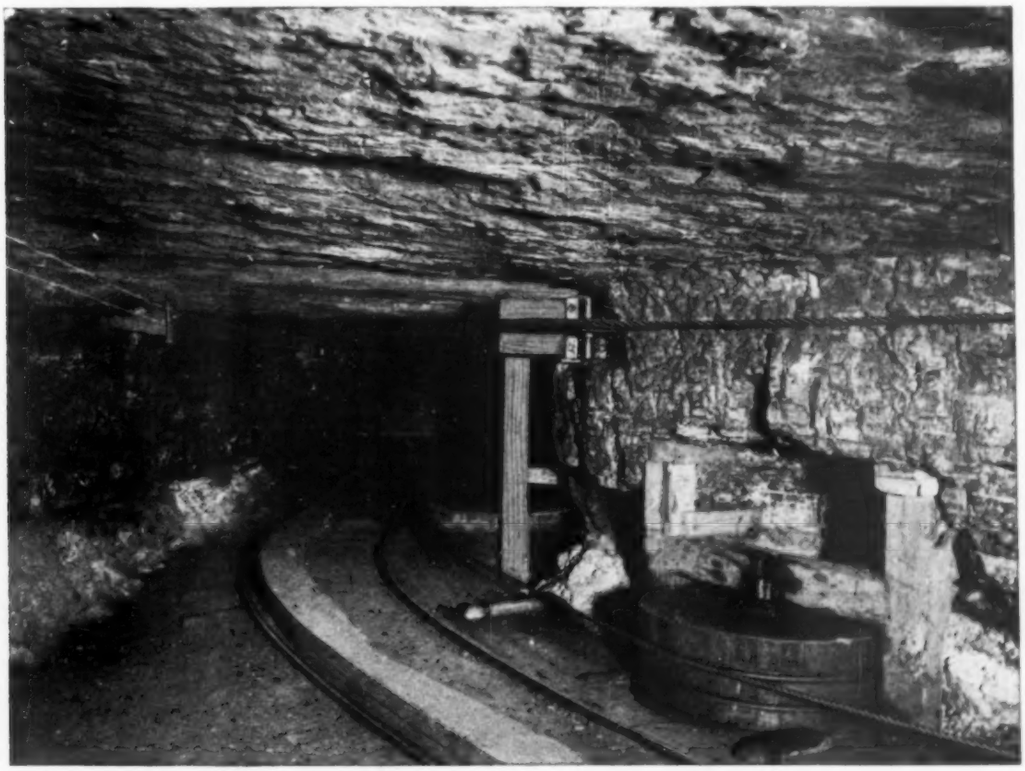


Fig. 2—Special Arrangement for Curves, Wire Rope Haulage System.

TESLA'S PREDICTIONS

Here are more wonders Tesla predicts for the new century, exclusive of the list of Tesla's predictions previously published in Popular Mechanics:

The pertection of the telautomaton, a machine having all its bodily movements controlled from a distance, without wires. Telautomatics are applicable to any machine that moves on the land, in water, or in the air.

The transmission of electrical energy through the earth without a wire.

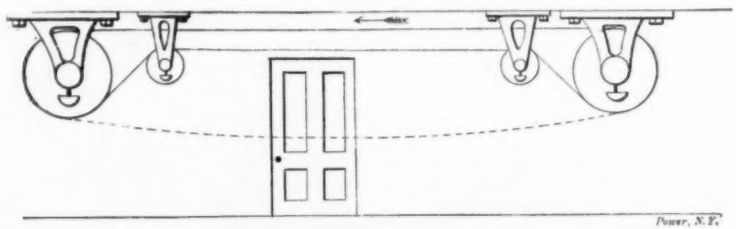
A system to draw energy from the sun.

The electrolytic process of extracting iron from ore, and molding it into required forms without fuel consumption.

SHOP NOTES

GETTING A BELT OUT OF THE WAY.

When in the basement of a large store some time ago I noticed a good scheme for getting a long belt up out of the way, says a writer in Power. It formerly occupied



Getting Around a Belt.

the position shown in the dotted line, but when the new engineer came he put in the two idlers and fixed it up as in the sketch, making it so a person could come through the door without bending almost double, and leaving more room for storing goods.

LIFE OF AUTOMOBILE TIRES.

Automobiles are expensive, first to buy, and then to operate. The rubber tires for instance quickly wear out, and it costs quite a lot of money to renew them. The Automobile Review says:

Perhaps the best method of gauging the value of a tire is its life in motor miles, as it gives a definite idea of about how much travel may be expected. The best pneumatic tires will give today, under good conditions of service, about 4,000 miles and it is a poor modern tire that will not cover 2,000 miles. This is a very decided improvement, 1,500 to 2,000 miles being considered a good tire life a year or so ago.

There are two main reasons for the severe strain on automobile tires; first, the small diameter of the wheels, necessary to bring the center of gravity of the machine low down where it should be, which causes all holes or depressions in the road to deliver a much heavier shock to the tire than would be the case with a large wheel, because it would not sink so deeply into the ruts. This coupled with the great weight the tire has to sustain when on a heavy car hastens the depreciation by the grinding together and crystalization of the surfaces of which the tire is composed.

This is perhaps one reason that the lighter cars made such a good record in the Paris-Vienna contest and also in the reliability run just finished in the east.

The second is the effect due to operation of the brakes in suddenly bringing the machine to a stop, all the energy and momentum of the car and mechanism having to be dissipated through the tires, upon which it is particularly severe.

High speed, too, of course, tends to wear out tires, but it is satisfactory to consider that as rapidly as the roads are improved, the life of tires will be materially increased.

While discussing this subject it is well to inquire what will be the effect upon tires of using crude petroleum to allay the dust nuisance. Rubber is most injuriously affected by the presence of oil and if this system which makes a very close, hard, compact and dustless road, is ever employed to any extent, it may become necessary to coat the tires in some way to prevent the action of the oil from attacking the rubber and causing it to harden and crumble, which is the usual effect of bringing these two things together.

USE OF ZINC.

Zinc should not be used in contact with copper, iron or lead, as voltaic action is set up, especially when moisture is present, thus destroying the zinc. Salt, lime, water containing lime, and acid woods are also very destructive of it. When first exposed to the action of the atmosphere it is speedily corroded, but the film of carbonate of zinc thus formed protects it from further oxidation.

POUNDING AIR WITH A HAMMER.

While it is known that air can be made solid as well as liquid, up to the present comparatively few experiments have been made in this direction. A scientist recently converted a certain quantity of liquid air into a small solid mass, and on examining it found it was as transparent as clear ice and as elastic as rubber. To test its elasticity he struck it with a hammer, and the latter immediately rebounded. That solid air may prove to be of commercial value is the opinion of some scientists in Germany, but it is admitted that many more experiments will have to be made before any certainty on this point can be arrived at.

An ink which can be used with a drawing pen on zinc and which is acid proof, is made of one drachm verdigris, one drachm sal-ammonia powder and one-half drachm lamp black, mixed with ten drachms water.

CASTING STEEL INGOTS IN HORIZONTAL MOLDS.

An English inventor has a new method of casting steel ingots. Instead of using vertical molds as is the custom everywhere, he pours the molten metal into horizontal molds which are kept moving by an endless chain. In passing along the ingot is cooled, then automatically dumped from the mold, which continues its journey until it again reaches the converter or furnace and receives another flow of metal.

ACCIDENTS ARE INCREASING.

Every day in the year 30,000 people in the United States are injured; 11,000,000 accidents occur each year. Some of these are trifling, but the number of deaths resulting has increased from 53 in each 1,000 in 1890 to 57 per 1,000 in 1900. Of all deaths in this country, 6 per cent result from accident. Italians in this country are more likely to die from an accident than any other nationality. Of 4,000 accidents, of which a careful record was kept, one-fourth were due to attempting to clear machinery while in motion.

TOOL FOR HOLDING PLOW BOLTS.

A useful tool, which is easily made and which is very convenient in holding plow bolts when removing the share is shown in the accompanying illustration.

On old plows coming into the shop, the bolts are rusted and turn when you try to remove the nuts. To overcome this difficulty, says a contributor to the American Blacksmith, I took a ⅝-inch rod for

A USEFUL PLOW-BOLT HOLDER.

the lever, and welded a piece of steel on the point, drawing it to a chisel edge to bear against the bolt head. This lever rod can slide in the ring hook, so that the device will fit any share, old or new. From the figure it will be seen that bearing down on the lever forces the sharp edge tight against the bolt, and securely holds it from turning.

The fishing for pearls in the sand bars of the Mississippi river will soon be exhausted owing to the extinction of the clam for button making, etc.

Krupp's oldest daughter, Bertha, gets the gun works, and becomes the richest woman in the world. Good-bye, Hettie Green.

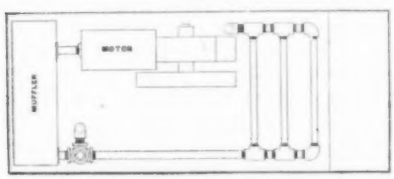
The wealth of the United States ($94,000,000,000) equals the combined wealth of England and France, the two next richest nations.

ANOTHER LARGE ELECTRIC TRANSMISSION PLANT IN CALIFORNIA.

Eight thousand horse-power will soon be coursing along wires from Cow Creek, high in the Sierras to Redding, Red Bluff, Keswick and other neighboring California cities. These towns are along the Sacramento river and a large part of the power will be used by farmers to operate electric pumps to irrigate orange and fruit ranches. Many thousands of electric pumps are already in use in California, reclaiming what were not long ago desert wastes. The Westinghouse company will furnish the machinery which will generate current at 34,000 volts, to be transformed to the usual working voltage on arrival at points where it is to be used.

SIMPLE METHOD OF HEATING AN AUTO.

A simple arrangement for heating almost any gasoline automobile at trifling cost is shown in the accompanying diagram. A set of heating pipes are located underneath the footboard of the machine, says the Motor Age, and connected with the muffler outlet by means of a length



Showing arrangement for Heating Pipes.

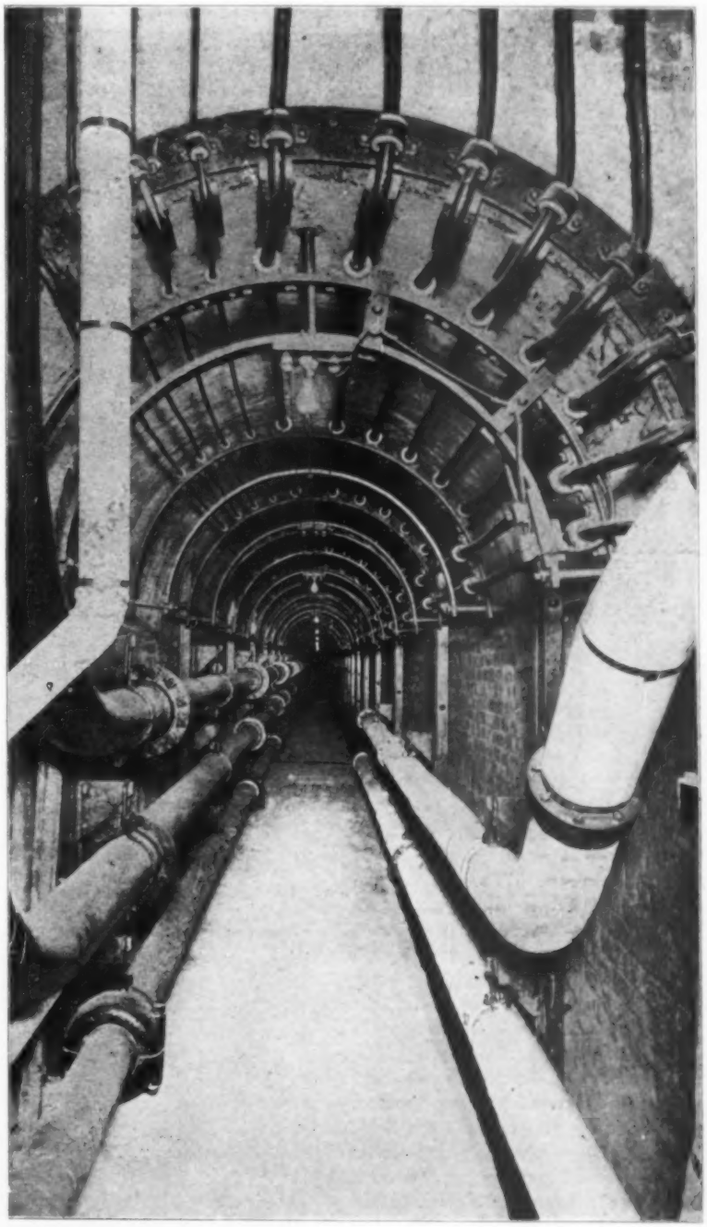
of pipe in which is located a three-way cock near the muffler. In warm weather, or on a mild day, the heater can either be wholly or partially shut off as desired.

An elbow is attached to the center outlet of the three-way cock. These elbows are placed in a downward direction so that the exhaust gases will be directed away from the vehicle and towards the ground. The material necessary for this outfit will cost from $3.50 to $4 and consists of the following: One mallable iron, 1¼-inch, three-way cock; seven 1¼ by 3-inch wrought iron nipples; four 1¼ by 1¼ by 1-inch malleable iron tees; three 1-inch wrought iron pipes 2 feet long—right and left hand threads; four 1¼-inch malleable iron elbows; one 1¼-inch flange for the muffler; one length of 1¼-inch wrought iron pipe, 4 to 5 feet long; two pipe hangers. The heating tubes should be connected in multiple as shown, and not in series or continuously; otherwise too much back pressure would occur.

"Perspective Drawing" is the title of an admirable, fully illustrated work just issued by the American Correspondence School, Armour Institute, Chicago. It treats the subject in a clear and understandable manner.

A TUNNEL FULL OF POWER.

Not the largest, but one of the most interesting, tunnels in the world has been constructed by Westinghouse, Church, Kerr & Co., for the American Car & Foundry Company, at Detroit. This tunnel, which is several hundred feet in length and of good size, as shown in the illustration, is literally full of unseen power. It connects the power-house with the several shops, and conducts the necessary pipes and wires. Far underground, safely removed from frost or accident, are the electric wires carrying light and power to thousands of lamps and hundreds of machines. One set of pipes conveys steam for various purposes, another hot water for heating the buildings in winter, and still another pair, most interesting of all water under a pressure of 1,500 pounds to the square inch, for working the great hydraulic presses. One of these presses exerts a pressure of 1,000 tons. Various other machines are operated hydraulically, and one great door, fifty feet long, is raised and lowered by this means quickly and without the slightest noise. It is situated in the car shop, and one man controls its movements with either hand with less exertion than he can wind his watch, and it is not a Waterbury, either. Filtered water is used, so no sand can cut the valves or impurities clog any of the parts of the machinery.



A Remarkable Tunnel in Detroit.

"AMERICAN INVASION" OF EUROPE'S FARMS.

"The American invasion" is working a wonderful change of scenes and conditions on the picturesque farms of the old world,

American Hay Loader in Europe.

as well as in the manufacturing establishments of the large cities. The farmer of these ancient lands is loth to abandon the old methods that have become sacred from long usage, but the scarcity of labor and necessity of keeping pace with the American market have necessitated the use of American implements. Thus it is that where hosts of laborers once tugged with pitchforks and hay wagons, the modern American hay-loader now moves through the wide fields dispensing with a great amount of manual labor and doing the work more satisfactorily and in greatly reduced time. In the accompanying illustration is shown an American made hay-loader near the town of Frome, England. These loaders have also invaded the fields of Holland, France, Germany and other parts of Europe and recent shipments have been made by the Deere & Mansur Co., of Moline, Ill., to Asia and Africa.

SCHEME TO COOL HOUSES.

Heating houses and stores by means of hot water or steam distributed like gas through pipes in the street is already being done in many cities. A Toledo, O., man is now working on a plan to send a cold brine through the same pipes in summer. This brine would flow through the radiators in a house and reduce the temperature in summer to nearly the freezing point, if desired. Instead of taking ice people would run these pipes into their refrigerators and ice boxes. Cafes could have cooling rooms where cold air would be served in place of cooling drinks. The proper invitation to your best girl would be "Won't you have a chill?" instead of the time-honored ice cream.

NOT ALL GRASS HUTS.

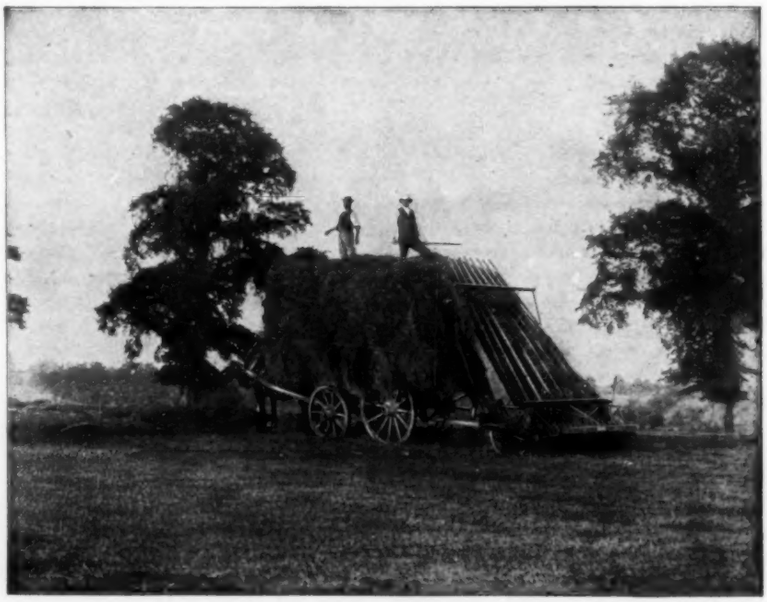
Members of the Builders' Exchange of Honolulu, Hawaii, are planning to combat the common impression among the states that grass huts are the common dwellings of the island territory. They will have an exhibition of Hawaiian architecture at the St. Louis world's fair, bringing the best features from an exhibition to be held in Honolulu at an early date.

PREPARING A NEW FLAT IRON FOR USE.

In preparing a new flat iron for use the following directions are suggested by the National Laundry Journal:

Take a new iron, heat it very hot; if on a gas or gasoline stove, shortly after being placed over the blaze you will notice a condensation, or sweating, taking place, which must be rubbed off, as it produces a roughness, then allowed to be heated as stated. Place a wooden bucket containing hard or well water handy, suspend the heated iron by a wire loop about two feet long, dip the iron into the water, allowing it to remain in about five seconds; after fifteen seconds repeat the dip for the same length of time in and out, until the iron becomes almost cool or warm enough to melt beeswax. Rub the wax melting a little on the ironing surface and sides, then wipe clean, and it is ready for use, and if not smooth enough repeat the process. The object in dipping the hot iron into hard or well water is to cause a precipitation of the lime contained, which adheres to the iron, placing on it a coating of lime or enamel which can not be excelled as an ironing surface.

Iron ore of excellent quality and bounteous quantity is said to have been discovered in Sullivan county, Ind.



Deere Loader in Southwestern England.

PRETTIEST TUNNEL IN THE WORLD.

Tunnel No. 1, on the line of the Oregon Railroad and Navigation Company has recently sprung into repute as being the most picturesque tunnel in the world. When riding on the Chicago-Portland special, the train seems to suddenly plunge itself into the depths of the earth and the passenger for an instant is mystified at the uncanny sensation he experiences,

Tunnel No. 1, O., R. & N. Railroad.

but the train just as suddenly bursts into the light again and the tourist finds himself once more speeding along in the midst of the picturesque scenery on the fastest train on the Pacific coast.

LAW POINTS FOR EMPLOYER AND EMPLOYED.

The duty of an employer to furnish his workmen with safe instrumentalities and appliances for the performance of their work applies to a foreman or superintendent as well as to a workman without rank or title. (88 N. W. Rep. 436)

An employe after complaint of insufficient light, continued to work on the promise of the foreman to furnish more light, which was not done, and it was held that the employer was liable for injuries resulting while performing the work ordered by the foreman. (65 S. W. Rep. 491)

An employe assumes, not only the risk of accident occasioned by the negligence of his fellow servants, but also of the known negligence of his employer, if he accepts or continues in such service after knowledge of such negligence. (40 S. E. Rep. 368)

A promise on the part of the employer to repair a machine known by the employer and employe to be defective will not relieve the employer from exercising ordinary care in the operation of that machine and he is required to exercise such care as is commensurate with the danger of operating the machine. (22 O. C. C. R. 518.)

Where a workman remains at work after knowledge of the dangerous condition of the place where he is working, but the employer has promised to repair the defect, and the danger is not imminent, the workman does not assume the risk of remaining in such service. (50 Atl. Rep. 964)

There one enters upon or continues in a service with full knowledge that it is dangerous, and of the extent of the danger, there is an implied contract of assumed risk, by which he waives his right to recover for injuries received in such service. (66 Pac. Rep. 799)

Water from the Puyallup glacier on Mount Tacoma, Wash., is to be used to furnish light and power for the cities of Tacoma and Seattle. A flume fourteen miles long with a drop of 600 feet will produce 50,000 horsepower.

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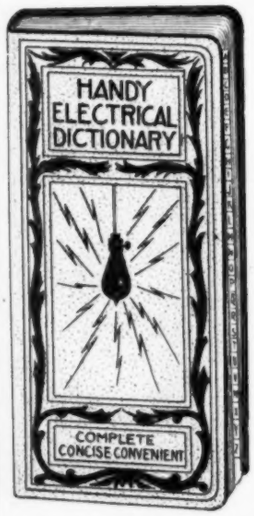

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EFFECT OF POISON ON THE BODY.

Arsenic Preserves Snake's Bite, Stings and Nicotine Cause Decomposition.

Bodies of persons who have died from poisons may rapidly decompose or be preserved according to the nature of the poison. Arsenic possesses wonderful powers in retarding putrefaction. Bodies of persons who have died from this poison have been exhumed after 24 months and vital parts of the organism were firm as if death had but recently occurred. A solution of arsenic injected into the arteries of a dead body will keep it sound for a long time. In death from prussic acid, morphine and cadaveric poisons putrefaction commences early and proceeds rapidly. The same is true in death from the bite of serpents and bite or sting of poisonous insects. Strychnine is said to possess a retarding power. Poisonous mushrooms, hemlock, mankshood, nox-vomica, etc., make the blood dark and thin and render the body prone to rapid decomposition. In deaths from nicotine, decomposition is said to begin almost instantly. The body becomes bloated, the skin tense and much distorted. Chloride of zinc, carbolic acid, corrosive sublimate, all of which are powerful irritant poisons, tend to preserve the parts of the body they effect.

PROVED HIMSELF WHAT HE THOUGHT HE WAS.

A man in Nebraska who committed suicide the other day, left a note saying: "I have just found out what an ass I am."

POOR OLD DAD

Ye kin sca'ce pick up a paper
  An' its "poets' corner" greet,
'Cept ye'll see er pirty poem
  'Bout the mother, saintly sweet;
But ye'll have a time a-searchin'—
  Eyes will be er'achin' bad
Ere ye'll overtake er poem
  At this time for pore ole dad!

No, it isn't willful in 'em—
  Them that write of mother dear—
That thar's never notice taken
  Of her ole man settin' near;
No, it's never meant to slight him,
  But hit looks a little sad—
All the bouquets made for mother,
  Not a bloom for pore ole dad!

True, our mother watched above us
  Till her dear old eyes wud ache,
But ole dad, he humped to feed us
  Till his back would nearly break.
Mother crooned above the cradle,
  Gave devotion, all she had;
Still, that wasn't any circus
  At this time for pore ole dad!

Do not take one line from mother
  When ye write the soul-sweet song,
But if thar's a word for father
  Now and then it won't be wrong.
Pore ole soul! He's bent and wrinkled,
  An' I know 'twould make him glad
If, while you are praisin' mother,
  Somethin's sed for pore ole dad!

—Cincinnati Commercial Tribune.

HOW TO MAKE A CLUB HOUSE SANDWICH.

To make a club house sandwich, says a contributor to the Hotel World, take the breast of a twelve-pound turkey, cut in small dice; two cans of mushrooms, all buttons; one can Mexican peppers; one dozen Dill pickles, cut each one separately very fine, and squeeze each article well, then mix with the turkey, together with about one pint of mayonnaise and a teaspoonful of paprika; crisp one pound of bacon, cut very thin; cut the bread and butter it; lay on a lettuce leaf, wiped dry, then a strip of bacon, then the mixture, then another leaf of lettuce, and then the other piece of bread; trim, cut cornerwise, wrap in wax paper. The above will make five or six dozen sandwiches.

ALL THE FAMILY READ IT.

"Popular Mechanics: Inclosed find renewal of my subscription. Your paper is the most interesting I have ever read. When I get it I read it from cover to cover on the spot, and all the members of my family read it also. Two of my friends have subscribed on reading it at my house, and several more make me visits expressly to read it."—H. S. Lane, 5739 Kimbark Ave., Chicago.

The speed record of the United States navy is now held by the new torpedo boat destroyer Stewart, which made 29.3 knots on her trial trip.

AMERICAN ABORIGINES.

That similarity in thought, in workmanship, in art and in religion characterized the various races that inhabited the continent of the New World before its discovery by the white man, was shown in every paper dealing with the subject at the recent congress of Americanists in New York.

EAGLE'S ENORMOUS STRENGTH.

An eagle having a weight of sixteen pounds can carry away a lamb weighing sixty pounds. To do this it must develop about two horse-power and must put a strain of more than 1,100 pounds on the muscles of the wings. This leads one to think that "birds are stronger than mathematics."

PETROLEUM FOR WAR VESSELS.

The report of the navy department on the suitability of petroleum for war vessels advises that it be used in torpedo boats, and expressed a fear that the multitude of electric wires in battleships and cruisers would endanger them from explosion of gas from the oil. The report shows oil to be so greatly superior to coal for merchant vessels that the installation of furnaces for the burning of petroleum in vessels of that class will be greatly increased.

PATENTED GRAVE.

Invention to Save People From Being Buried Alive.

Hereafter when a person wakes up in a coffin to discover that he has been buried alive all he will have to do is touch a glass ball in the coffin and instantly a flag will be automatically hoisted above the grave, an alarm bell will ring and a light will shine from without. A speaking tube leading down into the coffin will enable the revived one to converse with his rescuers while the work of exhuming the coffin progresses. The remarkable contrivance that makes these things possible is the invention of Count Karnic Karnici, a chamberlain to the Czar, who has always had a horror of being buried alive. The invention consists of a hermetically sealed iron box which is placed upon the grave. A hollow removable tube connects it with the coffin below. Inside the tube is a spring. One end of the spring is connected with the iron box. At one end within the coffin is affixed a glass ball which touches the chest of the buried body. The faintest movement of the ball, such as breathing, causes the spring to vibrate. Then the lid of the box opens and a flag is lifted out of it four feet above the ground; the alarm bell rings and the electric lamp in the box is lighted. When the box lid raises the tube admits to the coffin sufficient air to sustain life and the tube also serves as a speaking tube.

ONE OF JOHN ALLEN'S JOKES.

Ex-Congressman John Allen, known as "Private Allen," because he was the only private in the confederate army, was standing in Pennsylvania avenue, Washington, recently, watching the Grand Army of the Republic parade. With him were two ladies. As the multitude of Grand Army men swept by, Private Allen was visibly impressed. After several hours had elapsed Charles A. Edwards, secretary of the democratic congressional committee, came along. Allen greeted him, stopped him, and said:

"Edwards, how long has this parade been going along?"

"Four hours and a half," replied Mr. Edwards, after consulting his watch.

Mr. Allen heaved a sigh, says the New York Times, turned to the ladies and said in a tone of melancholy pride:

"Just see what I held at bay for four years."

THE CAUSE OF DIZZINESS.

The cause of dizziness and vertigo in looking from the top of a high tower or building is that in looking about the eye must adjust itself so rapidly to different horizons that one gets the sensation of a lack of equilibrium.

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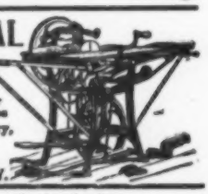
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